INTEREST IN NUTRIENT INFORMATION, NUTRITION TOPICS AND COMPUTER-GENERATED NUTRITION INFORMATION BY COLLEGE STUDENTS

by

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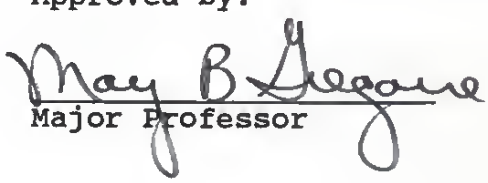

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TABLE OF CONTENTS

LIST OF TABLES

Table Page

INTRODUCTION

Fitness and health-consciousness trends have challenged college and university foodservice mangers to provide healthful menu items in order to better meet their students' needs. Jones (1) indicated that the interest in nutrition was not merely a "trend", it was a change of lifestyle. The author contends that college students were bombarded with nutrition information, both reliable and unreliable, which added to the increasing need for proper nutrition education. Bancroft (6) believed a good communication system between students and foodservice management was essential to allow the flow of ideas, needs, and interests to make realistic improvements.

Milano (9) demonstrated how nutrition information could be delivered in many forms. While reported students were interested in nutrition facts, newsletters might not be the best way to get these facts across. The author suggested that future studies be designed to consider media presentation and other non-written communication as alternate approaches for student nutrition education.

Anderson and Terry (10) conducted a study to determine effectiveness of various formats of nutrition education, desire for and use of nutrition information (bulletin and table tents), and acceptance of modified menus. Results indicated that table tents and bulletin boards were most frequently read. Students also would like to have new

nutrition information provided to them in the dining halls at least weekly.

Although extensive research has been done on nutrition education in college and university foodservice, most studies were designed with specific nutrients pre-chosen by the researchers. Relatively few studies are available which discuss the nutrition information of interest to college and university students.

The overall objective of this research is to study university residence hall students' interest in nutrition information. Specific objectives of this research are to:

- identify nutrients and nutrition topics of interest to university students,
- determine the degree of interest by university students for computerized nutrition information; and,
- compare the degree of interest in nutrition information by gender, age, length of time living in a residence hall, nutrition courses taken, and experience with physician-order diet.

REVIEW OF LITERATURE

College and University Foodservice

Students' Food Habits, Attitudes, and Preferences

Einstein and Hornstein (13) conducted a study to identify foods disliked by college students. Fifty thousand college students were asked to rate their preference for ten classes of food items: breakfast items, appetizers, soups, salads, sandwiches, entrees, vegetables, desserts, breads, and beverages. The most popular class of food was bread. A greater preference for salads and vegetables was noted for women than for men.

Handley and Sedlacek (3) conducted a five-year evaluation of eating habits in The University of Maryland dining halls. In 1972, a poll of a representative sample of 100 students indicated that they were relatively neutral about the variety and nutritional balance of food served, but enjoyed eating in the dining halls. A total of 450 students were surveyed using the same questionnaire in 1977. Results indicated 40 percent of the students agreed that meals served were nutritionally balanced, 35 percent were neutral and 25 percent disagreed. The authors concluded that some students' complaints might be due to unmet, unrealistic expectations about dining services. Suggestions by the students included: more attention to dieting or vegetarian dinners, improved nutritional values of food,

decreased starches and fats, and improved preparation of food, with particular emphasis on meats and vegetables. While only one percent of the comments addressed dieters and vegetarians as a special needs group, this figure represented approximately 65 diners in the board population. The authors concluded special attention to this group should be considered.

Lipari (7) reported the formation of a nutrition program called Pennutrition which was designed to keep the "nutritionally-minded" student as a foodservice patron. A total of 1141 students with meal contracts responded to a questionnaire with results indicating a marked desire for menu changes. Forty-four percent of the students wanted less red meat and a corresponding percentage wanted more "health food". Students who discontinued contracts in mid-semester cited dissatisfaction with "institutional" foods and a lack of satisfying vegetarian items as reasons for their discountenance. Similar sentiments were expressed on comment cards available at contract and a la carte facilities. A special food labeling system was developed as a result of this study to help students identify which foods were low in fat, sodium and sugar, and free of artificial colors or flavors.

Stephens and Shanklin (15) studied student expectations of a university foodservice. They stated that if student expectations of university foodservice could be brought in line with reality, students might become more positive about

the service. In an attempt to apply merchandising and marketing techniques, a questionnaire was distributed at Texas Christian University in Fort Worth to a random sample of 734 students, representing 28 percent of the student population participating in meal plans. Students were asked to rank, in order of importance, several aspects of foodservice: atmosphere, quality of food, cost of food, hours of service, and variety of food. Students also were asked to rate characteristics of foodservice such as food (taste, appearance, odor, texture, temperature and variety) and people (friendliness of employees, efficiency of employees, willingness of foodservice director to consider suggestions of students) as excellent, very good, good, fair, poor, or very poor. Students rated food quality as the most important aspect of a university foodservice. Variety and cost were rated as second and third in importance. Hours of service were rated fourth and with atmosphere for dinning rated, last. In summary, the students rated the characteristics of the foodservice as good or fair.

Werho (16) studied the eating patterns and food preferences of university residence hall students. A 58-item questionnaire was distributed to 285 randomly selected hall residents; 283 completed the questionnaire. The residents were asked how often they were willing to eat each of 40 selected menu items. They also were asked about their

meal eating, snacking, and milk drinking habits. Foods students were willing eat every day included soft-serve ice milk, salad bar, corn, french fries, fresh fruit, orange juice, and white bread. Nearly twice the number of males as females drank at least three glasses of milk a day. A significantly greater number of women (71 percent) than men (55 percent) indicated they had nutrition education course in high school, college, or other places.

Sparacio and Shanklin (17) developed and implemented a study to determine if student expectations of the university foodservice were similar to trends perceived by the foodservice industry. The authors stated that a greater diversity in eating habits, expanded travel and overall rounded experiences in life tended to make students more aware of inadequacies in their food selections. An increase in the number of international students also presented a special challenge for foodservice personnel to adjust menus and include new recipes to satisfy cultural trends. The authors commented that trends in foods offered in institutions were a reflection of the health consciousness of the American culture. An emphasis on quality of food, fresh fruits and vegetables, salad items and lower calorie entrees reflected the preference for these menu items as well as changing lifestyles.

Clark et al. (12) discussed use of nutrient analysis of foodservice recipes as a planning tool. Due to increasing

demands from the students, a complete nutrient analysis was conducted on lunch and dinner entrees served by the Stanford University foodservice system. The goal was to utilize nutrient analysis as a method of developing objective guidelines for menu planning. The nutrients of primary concern in this study were calories, total fat, cholesterol, and percent calories from fat. These were chosen as nutrient categories which could be used as health outcome predictors and were also measurable with substantial accuracy and confidence. Recipes which contained high, as well as low, percentages of cholesterol and fat were identified and listed to aid menu planning.

Nutrition Education

McCarthy and Sabrey (18) developing a questionnaire to determine the extent of Canadian university students' misconceptions about nutrition. A substantial number of respondents either answered the questions incorrectly or indicated they did not know the answer. The authors stated that nutrition education among university students was needed and residence hall foodservice should play a active role in providing this information.

Jones (1) reported the average consumer was confused by the plethora of facts and knew more than he understood about nutrition. The author believed students often ate unwisely because they were uninformed about proper food choices. Students knew enough to be concerned, but not enough to

differentiate between legitimate and illegitimate causes for concern, or to recognize when claims were based on misinformation. She advocated that if valid information was communicated with sufficient skill and conviction and in interesting ways, consumers would be receptive. The author stated that college feeding businesses were responsible for the nutritional welfare of their customers. Foodservice professionals should feel committed to providing and teaching good nutrition.

Corbaci (19) forecasted that for the next 200 years foodservice would be a part of a life-long learning process of education. As a result, residence halls where students lived and ate for a fixed time period would disappear. Students would use networks of facsimile, television, library, and computer hookups which would enable them to consult, watch or listen to the best instructors available on any particular subject. Their knowledge on nutrition would increase and market would be created for tasty, healthy meals in a cafeteria-like atmosphere on local campuses.

Bancroft (6) believed development of a nutrition education program was important in college foodservice. He stated such development required foodservice managers to be knowledgeable about the students they served. Suggestions and information from the registrar, counseling and test center, production records, food selection studies,

foodservice workers, and the students themselves should be gathered for future planning. He contended foodservice managers should let students know how to choose a balanced meal formally through newsletters, displays, table tents, and informally as foodservice workers reminded them to add vegetables or fruit to balance what they had chosen during meal times.

McAfee (20) concluded after reviewing several studies conducted with college students that students did not eat well and their knowledge about nutrition bordered on ignorance. The author reported that nutrition education was much needed among college students.

Dohrman (21) projected that by the year of 2000, college students would have a totally wide-open lifestyle. Life would be crammed with activity and led at a rapid pace, placing good nutrition at a premium to avoid illness.

Shriwise and Vaden (22) interviewed 203 randomly selected hall residents on their food habits. Their results indicated food habits of college students changed from high school days. There was potential for impacting on eating behavior through the residence hall program. The authors commented that student preference information should be collected periodically by college and university foodservices to ensure that operations were responsive to the needs and changing preferences of their clientele.

Lipari (7) reported that due to the increased demand for more nutrition education among the college and university students, a staff nutritionist should be available to help students who want assistance in planning individual dietary regiments. This staff nutritionist would also be responsible for conducting nutrition education through the presentation of various table tents and posters in the dining rooms.

According to Holland (8), The Oklahoma State University (OSU) Foodservice Team recognized the importance of nutrition as they developed a program which focused on developing sound healthful eating patterns for students. The OSU program included dietetic interns working with students to help increase awareness of ways to improve diet and overall health. The OSU program also helped students develop an awareness of proper nutrition; choose well-balanced meals; identify caloric value of the food consumed; and understand nutrition labeling and food additives. The author stated that foodservice no longer has the image of just feeding the students; it was another setting for the application of learning.

Sparacio and Shanklin (17) stated students were more knowledgeable and concerned with the nutrition aspects of food items and methods of preparation. Foodservice managers should be committed to providing nutritious food and disseminating accurate nutrition information. The authors

developed a questionnaire and administered it to selected students at two universities in the Dallas-Fort Worth metroplex. A total of fourteen-hundred students were randomly chosen; 900 (64 percent) completed the questionnaire. The majority of students at both universities (88.5 percent) responded that it was important for management to be open to new ideas and suggestions offered by the students. The increased interest in nutrition and health was supported by the number of students desiring nutrition counseling services; 48 percent of the co-educational university students and 54 percent of the single-sexed university students indicated the service should be provided.

In 1983, Werho (16) polled residence hall university students to determine how often they were willing to eat certain menu items. She reported an increase in the popularity of salads and certain vegetables from earlier studies. She stated college students appeared to be making wiser food choices in the 1980s than in the previous decade.

Carlson and Tabacchi (23) presented suggestions and recommendations for promoting nutrition information in restaurants. They stated the "nutrition market" consisted of consumers who had many different needs and who desire many types of food when eating out. They also reported buying behaviors of consumers interested in nutrition could be categorized into five groups: restrictive dieters; those

who require diet modifications because of health concerns; those interested in fitness and long-term health benefits; the elderly; and vegetarians. To be most beneficial, nutrition information in foodservice operations must be presented in a form that the consumer understands and can use.

Milano (9) investigated how knowledgeable university residence hall students were about nutrition using a 32-question true-false nutrition quiz which tested basic nutrition facts and common misconceptions. A further objective of her study was to determine the acceptance of newsletters as a way to increase nutrition knowledge and improve food choices of college students. A questionnaire was developed to collect information on students' eating habit, how often certain foods were consumed, and typical food choices that might be made from the cafeteria selection.

Results of Milano's study indicated 74 percent of the respondents had not nor were currently taking a course in nutrition. The majority of students perceived their dietary intake to "usually" be healthful. Results indicated these students seemed to be selecting more nutritious diets than had been reported by previous studies. However, Milano reported the responses from the nutrition quiz were not encouraging; scores indicated lack of understanding by students of nutrition facts. In the group who read the

newsletters, 45 percent believed information in the newsletters was useful in helping them select a more nutritious diet. The majority of students indicated that they would be interested in having nutrition information available to them in the dining area. The author concluded that university students were interested in nutrition facts but newsletter might not be the best way to get these facts across. She recommended that more studies be conducted to determine if increased nutrition knowledge and concerns were an actual trend for college students in the 80s. The author also recommended future studies should be designed to consider media presentations and other non-written communications as alternative approaches.

Kubena and Carson (24) studied the feasibility of developing a modified menus and nutrition information program. A Calorie Awareness Program (CAP), which provided information on energy and nutritional content of food, was developed for use in one of the four dining centers on the campus of Texas A&M University. CAP menus for each day of the 5-week cycle provided approximately 1,200 kcal, 30 percent from fat, 250 mg cholesterol, and 3 gm sodium. Posted daily CAP menus included energy content of each item as well as total energy, fat, sodium, and cholesterol. Calories provided as fat, protein, and carbohydrates for each meal were also posted. A questionnaire was developed to assess response to the program. Information solicited on

the questionnaire included demographic data, students' height, weight and record of food eaten at that meal. A total of 500 questionnaires were randomly distributed to students during breakfast, lunch, and dinner meal hours. Of the 97 students who responded, 35 percent reported regularly referring to information on the menus and displays, and 18 percent stated that they had followed the menus. Three-fourth of the students wanted the CAP to continue.

Anderson and Terry (11) in an attempt to improve university foodservice through nutrition information, revised entree selections and assessed patrons' attitudes. The objective of their study was to compare the food and time cost of conventional entrees and their reduced-fat-and-calorie versions. The study also assessed student desire for nutrition information, effect of the nutrition information, student's entree selection, and student attitude toward selected aspects of the dining center. During the study, one of the three entrees offered each evening was modified to reduce fat and calories. Three types of nutrition information: a bulletin board listing tips to control fat intake, table tents listing fat modification, and free handouts, were provided during the study week. A questionnaire was developed which requested information regarding attitude toward nutrition information; reasons for entree selections; and attitude towards the dining environment, service, and food. A total of 304

surveys were distributed. Results indicated that table tents and bulletin boards were most frequently read; only one-fourth of the students reported they read the handout. Although only 66.3 percent of the students believed the nutrition topics were interesting, over 80 percent believed the information presented was important, up-to-date and factual. When asked how often they would like to have new nutrition information provided to them in the dining center, 51.1 percent reported at least weekly, and 24.1 percent monthly. Respondents listed personal preference, appearance of the food, and appetite as primary reasons for food choice, while nutritional concerns were relatively unimportant.

Computer Application In Dietetics

Hayes and Abraham (25) stated that computers were best utilized when the volume of data was exceptionally large; the data processing operation was repetitive and lengthy; the processing of the data involved complex statistics or extensive classification; and speed in analyzing the data was essential. The authors also suggested that the computer could be used in dietetics to improve comparability of data from different studies, make application of new approaches to the analysis of dietary data easier, and store data for future use more efficiently.

In her review article, Hoover (26) summarized computer applications in dietetics and classified these applications

into three groups: foodservice management, clinical dietetics, and nutritional and patient care. In the area of foodservice management, the author indicated computers could be helpful in menu planning, production control, and food cost accounting. She stated electronic data processing had been used extensively in the field of clinical dietetics to calculate nutrient analysis for patients' menus. Computerized patient-oriented communication systems had sped up interactions between departments and allowed dietitians to enter notes into the medical record via computer terminals.

Youngwirth (27) also reviewed the evolution of computers in dietetics. She categorized computer applications in dietetics into five groups: clinical applications in foodservice management, clinical dietetics, instructional, continuing education, and other uses. Computer application in foodservice management include inventory control/purchasing systems, forecasting, recipe adjustment, production control, tray assembly and delivery, menu planning, and printing. Computer application in clinical dietetics concentrated on the application of nutrient analysis.

Nutrient Analysis in Clinical Dietetics

Thompson and Tucker (28), in their 1962 article, discussed how a simplified computer system might be used for calculating the nutritive value of a diet using a modern

computer. The authors also described how codes and punch card might be used with the computer to provide additional information for dietary studies.

Brisbane (29) demonstrated how to compute menu nutrients by data processing. The author also compared hand calculation and punch-card computerization of nutrients in a diet. Hand calculation was shown to be more costly and time-consuming than punch-card computerization.

Hoover (26) stated electronic data processing had been used extensively to calculate menu and patient food consumption; and to analyze metabolic diets, epidemiologic studies, nutritional surveys, and nutritional histories. The computer also had been used to summarize patients' eating patterns.

Youngwirth (27) commented that utilization of computerized nutrient analysis gained momentum when dietitians documented the speed and accuracy of obtaining detailed nutrient information and reports from data processing. The author reported that institutions had begun to design and develop nutrient analysis output to meet patients' needs. Individualized computer generated nutrient profiles were often presented with information on Recommended Dietary Allowances (RDAs) or the Index of Nutritive Quality (INQ), the ratio of nutrients provide to caloric requirement.

Dare and Al-Bander (30) described a computerized diet analysis system for the research nutritionist. The authors

stated the saving of time and increased accuracy offered by the computer were of key importance to the research nutritionists. Diets complexity, number of food items selected, patient food preferences, and skill of the individual designing the diet influenced the time saved. The authors reported that completing by hand a nutrient analysis of a menu for a specific nutrient required one hour to finish; calculating the polyunsaturated to saturated fatty acid ratio took up to four hours; determining percentages of nutrients at each meal took up to eight hours. However, one fourth or less time was required for calculation by the computer.

Computer Applications in College and University Foodservice

Finley and Simpson (31) researched computer applications desirable for the residence hall foodservice program at Iowa State University. A survey of selected National Association of College and University Food Service (NACUFS) member institutions was conducted to determine current utilization of computers in college and university foodservice. Of the thirty-four respondents, 65 percent reported using a computerized inventory control system and 62 percent used a computer assisted cost accounting system. Computer-stored recipe files were reported by 65 percent of the respondents. A majority of these systems used the factor method for recipe adjustment. Nutrient composition was included in 36 percent of the recipe files.

Ference (32) discussed the impact of computer utilization on college and university foodservice organizations. The purpose of her study was to determine the extent of computer utilization and the degree to which employee skill requirements and employment trends have been affected as a result of computer utilization. Two questionnaires were developed and sent to 211 (50 percent of the total membership) members which were on the NACUFS's 1981 membership list. The first questionnaire inquired about the present and future use of the computer. All participants were requested to complete the first questionnaire. The second questionnaire was used to evaluate the effect of computer utilization on employee skill requirements and labor trends and was completed only by the respondents of facilities that were utilizing the computer. Results showed that 40 respondents (47 percent) did not utilize the computer. Sixty-eight percent of the total respondents indicated that they planed to utilize the computer in the future.

The author reported that accounting and inventory functions were utilized in most university foodservices. Computer functions least utilized and showing little potential for utilization were sophisticated decision making functions such as simulation models and menu planning. Functions showing the most potential for future implementation were reports pertaining to production, sales

and cost analysis, purchasing, and the use of standardized recipes.

Ference also reported that there was an upgrading of skill requirements concerning computer training for non-supervisory, supervisory, and administrative personnel. Routine supervisory tasks such as determine cost and selling prices of items, and daily ordering of food and supplies were eliminated as a result of computer utilization. Supervisory employees believed they had more free time. Job elimination did not result at the supervisory level. Administrative decision making activities were shown to have increased when a computer system was installed and utilized.

Hiemstra and VanEgmond-Pannell (33) reported computer applications in school foodservice. The authors discussed computer applications of the early innovators of various systems; analyzed advantages and disadvantages of various hardware systems; and listed steps necessary to implement a computer system in a local food service operation. The authors identified increased efficiency and improved accuracy of reports as potential benefits of computer systems.

Garand and McCool (34) mailed a questionnaire to 196 college and university foodservice professionals to examine the prevalence of computer utilization. Their overall findings indicated that computers were presently being used in college and university foodservice in five functional

areas: standardization of recipes, purchasing/storage, food production, service, and managerial information. All of the applications listed were used by college and university foodservice except client menu selection, a service-oriented application. The authors indicated that the most frequently used application was managerial information application, followed by purchasing/storage applications. Service areas such as client education, nutrient analysis, client menu selection, and participation tally were among the least used.

Recommendations for Selecting Nutrient Analysis Software

Ference (32) stated that when selecting computer software for an organization, buyers needed to remind themselves that there is no "perfect" nutrient analysis software. The software chosen should meet the operation's daily needs. The author described two types of software--prewritten and custom software. She defined prewritten software as one written by software developers; programs could not be altered by users to meet individual needs. She defined custom software as one written and customized for a particular user; changes could be made by the user to fit operation procedures. Prewritten software was developed and sold by a variety of different hardware vendors. Prewritten software was always less expensive than the custom software, but usually the prewritten software did not meet the firm's exact need. Ference stated if software does

not fit into an operation's procedures, the firm must change its procedures to fit the software, change the software to fit the procedures, or find better software.

Dwyer and Suitor (35) discussed several considerations for the selection process of a computer system. First, the exact purpose of the system must be determined: will it be for research purpose, for assessment of patients' education or for nutrition education? Second, decide whether are these identified purposes are worthwhile. Other considerations were: cost, hardware compatibility, and reliability and validity of the data base.

Frank and Pelican (36) reported that microcomputers provided an effective and efficient method for dietary data management and analysis. Selection of a microcomputer system was simplified when specific tasks were defined. The authors attempted to provide a model for listing dietary analysis needs and priorities. Sample dietary analysis tasks are listed for five areas of responsibility: clinical, metabolic experimental, epidemiological, administrative, and educational. Characteristics of primary importance for selecting a nutrient analysis system were identified as: validity of the data base, soundness of the programs' internal operating procedures, clear and complete documentation, easy-to-read computer output, and credibility of the developer.

Fowler (37) evaluated various computer systems and suggested factors to consider in the selection of computer system for foodservice. The author commented that users needed to establish short and long-term goals for computerization of their organization. She stated users should develop a request for proposals (RFPs) to solicit vendors and provide an objective basis for comparing vendors and their software packages. A more in-depth comparison of the software package features and cost could be conducted upon receipt of the RFPs. When comparing basic package prices of software systems, the author reminded users of eight hidden costs which needed to be considered: maintenance, installation, training, documentation, enhancements, backups, additional tapes or disks, and telephone calls to the vendor. Taxes, travel and lodging expenses incurred during training and implementing should also be considered.

Dare and Al-Bander (30) emphasized the importance of an interactive, efficient, and easy to use computer system. They suggested that entering food items by numerical codes was tedious and might create potential source of error; computer systems that allowed data entry by common food name might decrease the time spend entering the food items and chance of error. The authors stated that accurate and automatic conversion factors for translating common

household measures into gram weight would increase the ease of date entry and decrease the time required.

Orta (38) reported ten key questions which could serve as guidelines for evaluation of nutrition related computer software. He encouraged users to ask themselves what the intended purpose or function of the desired nutrition software would be. Users also should establish criteria or specifications pinpointing functions expected of software. According to Orta, special attention should be given to system requirements, equipment or other enhancement which are needed in order to use the software effectively. Software should to be examined to test its flexibility for adaptation to specific needs and data base expansion.

Program Features of Nutrient Analysis Softwares

Murphy et al. (39) reported that the minimum information that college students needed from a diet analysis was the total intake of all nutrients. Other desirable features included: a display of the nutrient content of each food item in the diet; a subtotal of the nutrient content of each meal; the percent of RDA (or other dietary standard) for various nutrients according to the user's age, sex, and size; an indication of which foods contributed large amounts of specific nutrients such as salt, cholesterol, fiber, etc.; a display of various other calculated figures, such as calcium to phosphorus ratio or polyunsaturated fat to saturated fat ratio. The authors

described a dilemma facing nutrient educators: how to minimize the tedious task of coding food items, while retaining a large enough selection of food items to ensure that the resulting analyses were meaningful. They commented on two methods which worked well for data entry: students could enter an approximate name of a food item and be prompted for more details by the computers, or the computer system could display a series of tables from which the student selected the correct food item. Although both of these methods might cost more than manual diet coding, they provided students with a much easier way of entering dietary data.

Byrd-Bredbenner and Pelican (40) indicated guidelines for selecting nutrient analysis softwares. They recommended computer software should be able to "flag" on the printouts or in some way indicate those nutrient totals calculated using missing values for some foods. Computer software also should take nutrient losses into account before calculating the total nutrient information. The authors suggested dietitians should compare results with published results to see if it was scientifically accurate when evaluating nutrient analysis printouts. Users should also examine whether the printout and printed recommendation were appropriate and meet the needs of the user/audience. Printouts should be well-organized, presented in a logical manner, and easy to interpret.

Anderson and Jansen (41) commented that with increased use of nutrient analysis programs by the general public, problems could arise both with the quality of the input and with the interpretation of the output. In responses to these problems, nutrition educators need to develop resources that would help lay audiences submit accurate information and correctly interpret the analysis of that information. These resources could range in form from printed user guides and explanations, to audiovisual programs, computer software, and structured classes. Nutrient analysis programs should also have accompanying support resources to explain the output simply and concisely. The authors recommended programs should generate information in terms of RDA, U.S.RDA, or nutrient density because but most lay audiences did not understand these concepts or their relationship to dietary assessment. Well-developed support materials could help bridge these gaps in understanding these computer printouts.

Maruyama and Forester (42) discussed nutrition topics which were available on computers to attract public attention in places such as shopping malls or fairs. The topics of the programs developed by the authors included: nutrition for athletes, choosing good snacks, vitamin facts and fallacies, sugar in the diet, weight control, diet and health, and food sources of nutrients.

Maruyama and Forester (42) also reported on work conducted by Moore which concluded that the degree of sophistication of computer-assisted instruction graphic displays did not appear to increase instructional effectiveness. They also cited Rigney and Lutz's study which found lessons incorporating animated graphics resulted in higher scores on recall tests of knowledge, comprehension, and application. Students also seemed to find lessons with animated graphics more attractive.

Smiciklas-Wright et al. (43) conducted a study to determine how well older adults were able to comprehend information from a printout of a computer-analyzed 24-hour food record and an accompanying explanation booklet. Participants received a printout of the following values for a 24-hour intake: percent of RDA for 11 nutrients; milligrams of sodium; kilocalories; and percent of kilocalories from protein, carbohydrate, and fat. Individuals who consumed less than 68 percent of the RDA for any nutrient received a message which noted that their intake was low and provided dietary suggestions. Individuals who consumed large amounts of certain nutrients such as protein, sodium, and vitamin A also received cautionary messages. A definition of the RDA appeared on each printout. The printouts were returned to the respondents along with an explanation booklet and questionnaire. The explanation booklet provides information

on the RDA and guidance for interpreting the printout. Results indicated that the RDA concept was difficult to grasp and/or was inadequately explained in the booklet. Almost one-half of the subjects commented that they had difficulty comprehending information taken from the printout. The authors concluded that nutrition educators needed to identify and use techniques that make computer-generated information readable and understandable. Health-care professionals should question the advisability of clients' reading technical data, such as computer summaries with comparisons to RDAs, without consultation by a qualified person.

Dare and Al-Bander (30) stated that a computerized diet analysis system for the research nutritionist should be easy to use. The authors described a format of printout which would facilitate better interpretation. They stated computer printouts should display nutrient content of each food item in the diet. Missing nutrient values should not be labeled as zero but should be flagged or identified on the printout. Systems should be able to provide options for meal-by-meal nutrient subtotals and percent of total calories from macronutrients, ratio of polyunsaturated to saturated fatty acids, and comparisons with RDAs. Software programs should also allow the nutrient totals of a diet being created to be compared with specific target nutrient

values and then allow subsequent adjustments to be made until the diet finally meets the desired nutrient values.

Byrd-Bredbenner et al. (44) discussed computer-analyzed dietary intake printouts and suggested guidelines for their design and student comprehension. The purpose of their study was to determine the ability of individuals to comprehend and interpret information on nutrient analysis computer program printouts and to assess student understanding of certain concepts closely related to such printouts, specially the Recommended Dietary Allowances (RDAs) and vitamin and mineral supplementation. A total of 553 college students were randomly assigned to one of seven groups. Each group received a nutrient analysis computer printout that varied in terms of type, amount, and format of information supplied. Research results indicated that most individuals had misconceptions concerning the RDAs and vitamin and mineral supplementation. Data presented in graphic format were more easily understood than data in spreadsheet format.

Byrd-Bredbenner et al. (44) also presented eight design recommendations for nutrient analysis computer program printouts:

- a clear, concise explanation of the RDA should be included on computer printouts;
- all nutrient analysis data should be reported in a concise manner directly on the computer printout. Alternate methods of formatting or presenting information on the printout should be considered for various population subgroups;

- a clear, concise statement about the use of vitamin/mineral supplements should be included on the computer printout e.g toxicity level of fat soluble vitamins, certain minerals taken in large amounts can interfere with the functions of other nutrients. All information on the printout should be formatted and spaced to facilitate readability and understanding. A clear, high-quality print should be used on all computer printouts;

- whenever appropriate, data should be presented in a graphic format (e.g. bar graphs depicting percent RDA consumed and pie charts to illustrate percent of calories contribution). The graphics used should facilitate user reading, understanding, and interpretation of the printout;

- an explanation of the uses and limitations of the information on the computer printout should be included on the printout itself;

- guidance for seeking additional accurate nutrition support and information should be included. Sources of qualified health professionals would be helpful to include;

- specific information on how to improve dietary intake should be in the printout. Summary of diet deficiencies/excess of nutrients also would be helpful to users.

METHODOLOGY

Study Site

The study was conducted at a large land-grant university located in the midwest section of the United States. The university has approximately 20,000 students enrolled in eight colleges and the graduate school. There are nine residence halls on the campus housing approximately 4,000 students.

Three central food centers serve students living in the residence halls. Derby Food Center, the largest, serves students from four halls; Kramer Food Center serves students from three and Boyd Food Center serves two. Each food center serves food to students from service areas which are termed "lines". For noon meals, Derby Food Center serves meals from hamburger, taco, and regular hot food lines; Kramer Food Center has two service areas: hamburger and regular hot food lines; and Boyd Food Center has only one service area, the regular hot food line. For evening meals, a regular hot food line is the only type of service area for all three food centers except Derby Food Center, which has an additional service area, called the soup and salad line. All three food centers use the same menu cycle for hot food served.

Approximately 7,500 meals are served per day. The number of students served on weekends is usually considerably less.

The objectives of the residence hall foodservice are to serve quality food that is nutritious, palatable, attractive, and safe; move the students in the direction of good food habits; and promote the furtherance of social and education programs in cooperation with the other units (45).

Research Plan

Data collected to fulfil the objectives of the study included: students' interest in obtaining information on various nutrient components and nutritional topics, and students' interest in utilizing nutritional information from computer. A questionnaire was developed and used to collect these data.

The Director of Housing for the University, and the Head and Unit Managers of Residence Hall Foodservice were consulted prior to beginning and periodically throughout the study for their suggestions. Approval for the research project was obtained from the Director and Associate Director of Housing.

Sample

Hall Residents

A stratified random sample of 20 per cent of students living in the residence halls serviced by the three food centers was selected to complete the questionnaire. The residence hall population was stratified; the sample chosen

was proportional to the number of students living in each hall (Table 1).

Table 1. Comparison of study sample and hall population

	hall population		study sample[1]	
	N	%	N	%
residence hall:				
Boyd	212	5.4	42	5.4
Putnam	198	5.1	40	5.0
Ford	629	16.0	126	16.0
West	303	7.7	61	7.7
Haymaker	625	15.9	125	15.9
Moore	609	15.5	122	15.5
Goodnow	591	15.1	118	15.1
Marlatt	589	15.0	118	15.1
Edwards	169	4.3	34	4.3
Total	3925	100.0	785	100.0

[1]Random sample stratified by residence hall.

Hall Staff

Hall staff, employed by the Department of Housing, are students who reside on designated floors in the residence halls. Their major responsibilities are to help coordinate and organize floor activities, carry out residence hall polices, orient new hall residents to their academic and social environment and relay residents' concerns to the Department of Housing. A group of 26 newly appointed hall staff participated in this study.

Food Committee

Each of the three food centers has an established food committee which consists of elected representatives from

each floor of the residence halls using that food center. These food committees meet once a month with the unit manager and dietitians from their food center. Food committee members gather comments, new ideas, or complaints concerning the foodservice from the hall residents on their floor and relay them to the foodservice staff during the monthly food committee meetings. Minutes from these meetings are sent to the residence halls to be posted.

Food Committee members are not mandated to participate in every meeting; however, they are encouraged to attend as many meetings as possible. A total of 40 students served as food committee members during the study. Derby food committee had 18 members; Kramer food committee, 16 members; and Boyd food committee, six members.

Research Instrument

Instrument Development

A questionnaire was developed to gather information for this study (Appendix A). The question format was designed for easy comprehension to minimize time for completion. The questionnaire consisted of 13 questions, with some questions requiring multiple answers. Information asked was divided into four major sections: biographic/demographic, nutrient component, nutritional topics, and desired nutritional information from computer.

The questionnaire was printed on both sides of a single sheet of colored paper, pink paper for hall residents,

yellow for hall staff, and green for food committee members. The front page of the questionnaire identified the sponsor and contained the biographic/demographic section which included questions on gender, age, student classification, major, number of semesters in residence hall, food center and line for noon and evening meals, nutrition related courses taken in high school or college, and experience with a physician-ordered diet.

The back page of the questionnaire contained the three remaining sections which were divided into a total of 31 sub-questions. Instructions printed at the top of the back page of the questionnaire explained how to complete all questions on that page. Questions in all three sections were answered using the same five-point scale to indicate the degree of interest:

1= not interested
2= somewhat interested
3= in between
4= fairly interested
5= very interested.

In the nutrient component section students were asked to indicate their degree of interest in knowing the nutrient content for each menu item. Three open ended questions were added at the end of this section to allow students to include other nutrient components in which they were interested. Students then were asked to express their degree of interest in obtaining additional information for eight nutritional related topics in the nutritional topics section.

In the final section, nutrition information from a computer, students were asked to indicate their degree of interest in knowing seven types of nutrition information from a computer software program. An open ended question was included at the end of the page to ensure that students' suggestions and concerns related to using nutritional information were considered.

Instrument Distribution

Hall Residents. Two weeks prior to the delivery of the questionnaires to hall residents, two memos, one to hall directors (Appendix B) and one to hall staff members (Appendix C) were sent through campus mail. The memo to the hall directors briefly described the background and objectives of the research. A copy of the questionnaire (Appendix A) and the memo to hall staff (Appendix C) were attached to the hall directors' memo to provide more information about the study.

The memo to the hall staff members (Appendix C) explained the background and objectives of the research project. The purpose of this memo was to notify hall staff members that a package of questionnaires with instructions would be sent to them in two weeks. Instructions for distributing and collecting the questionnaire also were addressed in this memo.

Two weeks later, packets containing materials for the study were sent to hall staff members. Hall staff members received the following:

- a cover letter (Appendix D);
- a large envelope labeled "Nutrition Survey" on the back and with the researcher's address on the front;
- material addressed to hall residents living on their floor.

The cover letter to hall staff members briefly described the study and contained instructions for distributing the questionnaires to hall residents and returning the questionnaires to the researcher. A large envelope labeled "Nutrition Survey" and with the researcher's address on the front was to be posted in a convenient location on each floor for collection of completed questionnaires.

Material for to hall residents included:

- a cover letter (Appendix D) with the name and address of each hall resident chosen for the study;
- questionnaire (Appendix A).

The cover letter to residents explained the objective of the research and provided instructions for returning the questionnaire to hall staff members. A questionnaire was stapled to the cover letter.

Packets were delivered to hall staff members during a hall staff meeting held during the ninth week of spring semester. Hall staff members were asked to distribute material addressed to the selected students on their floor whose

names appeared on the research letter. An envelope labeled "Nutrition Survey" was posted at a convenient location on each floor. This envelope with the researcher's return address label on it was returned to the researcher through campus mail after one week.

Hall Staff. During a training session, all newly appointed hall staff members were asked to participate in this study. Because these hall staff members were also students and could have been one of the students randomly chosen, they were advised not to answer the questionnaire if they had already received and filled one out. A total of 28 usable questionnaires were returned.

Food Committee. A total of 18 food committee members participated in the three food committee meetings held at each food center during the study. Staff dietitians attending food committee meetings were asked to give the questionnaires to committees members. Because food committee members were also students and could have been part of the randomly selected student group, they were advised not to fill out the questionnaire if they had already received one. Eighteen usable questionnaires were obtained from this group.

Data Analysis

Programs and routines in the Statistical Analysis System (SAS) (45) were used to analyze data for the study. Frequencies were determined for all variables. Mean

response was computed for all variables rated using the interest scale. Chi-squared goodness-of-fit test was used to determine differences between male and female students' classroom nutrition knowledge. Correlations among nutrient components, nutrition topics and computer software features ratings were compared to examine interrelationships using Pearson Products Moment Correlation Coefficient. Because sample sizes were unbalanced, the general linear model analysis of variance procedure was used to determine the relationship of students' demographic data (gender, age, semester in hall, nutrition course taken, and physician-order diet) to students' ratings for nutrient components, nutrition topics, and computer program features. Information provided from SAS general linear model analysis of variance was used in the equations to estimate mean and standard error.

RESULTS AND DISCUSSION

Description of Survey Sample

A total of 829 questionnaires were distributed to study participants; 534 questionnaires were completed and returned for a response rate of 62.4 percent (Table 2). Percent response was highest from Boyd and Putnam (82.5 and 80.8 respectively) and lowest from Marlatt, and Moore (51.8 and 48.4 percent respectively). Residence halls housing fewer students had higher response rates than the larger halls'; possibly because hall staff members in the small halls may have had more opportunity to encourage all participants on their floor to return the questionnaire. Boyd, West and Ford, which house only female residents, had higher response rates than residence halls' housing only males (Haymaker and Marlatt); possibly indicating a stronger interest in the study by females.

Table 3 presents demographic data about the study sample divided by gender. The number of male and female respondents was approximately equal. The majority of students responding were in the age range 18-22 years old, and were classified were as freshmen (52.9 percent). The sample is representative of the residence hall population but contains a high percentage of freshman than the university population (Table 4).

Table 2. Response to nutritional analysis questionnaire

sample group[a]	no. of questionnaire distribution	no. of questionnaire returned	response rate
	n	n	%
residence halls:			
Boyd	42	35	83.3
Putnam	40	32	80.0
Ford	126	85	67.5
West	61	46	75.4
Haymaker	125	83	66.4
Moore	122	59	48.4
Goodnow	118	64	54.2
Marlatt	118	61	51.7
Edwards	34	25	73.5
total	785	490	62.4
hall staff:	26	26	100.0
food committee:	18	18	100.0
total	829	534	62.4

[a]20 percent of the total hall resident population was included in sample

Table 3. Characteristics of university hall residents

characteristic	gender				total	
	male		female			
	N	%	N	%	N	%
gender	243	45.5	291	54.5	534	100.0
age						
18 or under	35	14.4	77	26.5	112	21.0
18 to 22	178	73.3	194	66.6	372	69.7
23 or over	30	12.3	20	6.9	50	9.3
total	243	100.0	291	100.0	534	100.0
classification						
freshman	119	49.0	165	56.1	284	53.2
sophomore	59	24.3	52	17.7	111	20.8
junior	34	14.0	45	15.3	79	14.8
senior	20	8.2	16	6.5	36	6.7
graduate	11	4.5	13	4.4	24	4.5
total	243	100.0	291	100.0	534	100.0
majors						
agriculture	15	6.2	18	6.2	33	6.2
architecture	28	11.5	15	5.2	43	8.1
arts and sciences	51	21.0	87	30.1	138	25.9
business administration	37	15.2	49	17.0	86	16.2
education	14	5.8	46	15.9	60	11.3
engineering	77	31.6	22	7.6	99	18.6
human ecology	5	2.1	26	9.0	31	5.8
veterinary medicine	9	3.7	4	1.4	13	2.4
undecided	7	2.9	22	7.6	29	5.5
total	243	100.0	289	100.0	532	100.0

Table 4. Comparison of sample with residence hall and campus population by classification

classification	sample		residence hall population		campus population	
	N	%	N	%	N	%
freshman	284	53.2	2524	58.7	4004	26.1
sophomore	111	20.8	779	18.1	3077	20.1
junior	79	14.8	578	13.4	2837	18.5
senior	36	6.7	270	6.3	3936	25.6
graduate	24	4.5	151	3.5	1494	9.7
total	534	100.0	4302	100.0	15348	100.0

The largest number of students in the study were enrolled in the College of Arts and Sciences; the least were in Veterinary Medicine (Table 3). These percentages of students in the various colleges were fairly representative of university enrollment among colleges.

Table 5 presents characteristics of university hall residents. The greatest percent of students in this study had lived in the residence halls only one semester prior to the study (Table 5). Previous studies of university studies on this same campus showed similar results (47,48). Boyd, West, Ford house female students only; Haymaker and Marlatt are male halls; and Putnam, Moore, and Edward are co-ed halls.

Noon Meal

The largest percentage of students, 55.4 percent, reported they ate their noon meal at Derby; 31.3 percent at Kramer

Table 5. Semester in residence hall and distribution of students by hall

characteristic	gender				total	
	male		female			
	N	%	N	%	N	%
semesters in residence hall (excluding current semester)						
none before	11	4.5	14	4.8	25	4.7
1 semester	138	56.8	195	67.2	333	62.5
2-3	62	25.5	41	14.1	103	19.3
4-6	22	9.1	29	10.0	51	9.6
more than 6	10	4.1	11	3.8	21	3.9
total	243	100.0	290	100.0	533	100.0
residence hall						
Boyd	0	0.0	35	13.3	35	7.1
Putnam	17	7.5	15	5.7	32	6.6
Ford	1	0.4	84	32.1	85	17.3
West	1	0.4	45	17.2	46	9.4
Haymaker	83	36.4	0	0.0	83	16.9
Moore	26	11.4	33	12.6	59	12.1
Goodnow	24	10.5	40	15.3	64	13.1
Marlatt	61	26.8	0	0.0	61	12.4
Edward	15	6.6	10	3.8	25	5.1
total	228	100.0	262	100.0	490	100.0

and 13.3 percent at Boyd. These results were not unexpected because Derby Food Center serves students living in four residence halls.

The majority of students (61.4 percent) responded that they got their meals from the regular hot food line service area 12.0 percent students from the hamburger line area, and 8.2 percent from the taco line area. Ninety-eight students (18.4 percent) commented that they did not have a preference for service area. Some students indicated they went to the service area with the fewest number of students waiting so they could obtain their meals faster. In contrast, 14 years ago 63.5 percent of students who ate at the same dining centers indicated they hardly patronized the hamburger line service area, and less than three percent of the students chose the hamburger line service area more than three times a week (47). These results suggest that students may now be more interested in alternative food choices, such as hamburgers and tacos, than previously.

Evening Meal

Of the 534 students responding on which food center they had their evening meal, 55.6 percent indicated Derby; 31.1 percent Kramer and 13.3 percent Boyd; a distribution similar to that reported for noon meals'. Most students indicated they went to regular hot food line service area for their evening meals (92.7 percent); only 7.1 percent indicated that they patronized the soup and salad line service area.

Although each food center is designed to serve residents in specified halls, students on meal contract are allowed to eat their meals at any food center. Students often patronize a food center other than the one designated for their residence hall. The primary reason given by the students for eating at a specific food center was that their afternoon classes were closer to that food center. Other reasons given were: one food center was less crowded than another; habit; food was better in one food center than others; and the atmosphere and dining room setup were more attractive in one food center than others.

Nutrition Related Courses in High School and College

Only 39 percent of the students reported having taken a nutrition related course(s) in high school and/or in college (Appendix E). Of this group, 22.1 percent were male and 16.9 percent were female. Chi-square value ($p=.407$) indicated no significant difference between males and females.

Students were asked to name the nutrition related courses they had taken during high school and/or in college. Classes reported were in three major areas: high school nutrition classes, college food and nutrition classes; and college-level basic science courses. These nutrition classes were either as a separate nutrition class or as a component of a class such as high school health, home economics, and college biochemistry.

Anderson and Terry (10) reported in their study that 79.1 percent of their total sample had had nutrition education in high school courses. Less than 15 percent of the respondents reported that they had had nutrition education in university nutrition classes, other university classes, or community groups or workshops. Approximately 90 percent of females and 75 percent of the males indicated having received previous nutrition education in one of these four types of classes.

Physician-ordered Diet

Very few students (8.2 percent) reported that they were currently and/or had been placed on a physician-ordered diet (Appendix F). Of those who had been on a physician-ordered diet, nearly two-third were female. In general, the most common diet order was a low-fat, low-cholesterol diet. A few students also indicated they were on calorie-restricted diet, ulcer diet with no spicy food or caffeine-free diet. Very few student (n=2) reported they were on diabetic diet. Although vegetarian diets and Weight Watchers' diet plan were not considered physician-ordered diets, 13 students commented that they were on one of these diets.

Nutrient Components

Means

Students were asked to rate their interest in 11 nutrients using a five point interest scale ranging from 1, not

interested to 5, very interested. Means and standard deviations were computed for the three sample groups; hall resident (HR), hall staff (HS) and food committee (FC). Analysis of variance was conducted to examine whether differences existed in the three sample groups; no significant differences were found. The three groups were then combined prior to additional data analysis and labeled as "total KSU students" (TKSU).

Students interest ratings for the nutrients are shown in Table 6. Results indicated that students were fairly interested in knowing the calories (3.60), cholesterol (3.44) and fat (3.28) for each menu item and were somewhat interested in the remaining nutrient components. Students did not have a strong interest or disinterest for any of the 11 nutrients. Because the interest was greatest for calories, cholesterol and fat, these nutrients would be ones that foodservice managers may want to consider providing information on for each menu item.

Analysis of Variance

Information provided from SAS general linear model analysis of variance was used to determine whether differences existed in students' interest ratings for the 11 nutrient based on their gender, age, semester in hall, nutrition course taken, and experience with physician-ordered diet. Results from the analysis of variance indicated that no significant differences were noted on

Table 6. Mean ratings[a] of interest in nutrient components by sample group[b]

nutrient components[d]	sample group[c]							
	total KSU students		hall residents		hall staff		food committee	
	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.
calories	3.60	1.49	3.59	1.48	3.88	1.53	3.44	1.58
cholesterol	3.44	1.42	3.48	1.41	2.92	1.41	3.28	1.64
fat	3.28	1.43	3.29	1.42	3.04	1.51	3.28	1.60
sodium/salt	3.17	1.39	3.19	1.39	2.92	1.41	3.11	1.41
protein	3.16	1.36	3.17	1.34	3.08	1.62	3.00	1.53
vitamin	3.11	1.38	3.11	1.37	3.35	1.52	2.72	1.36
calcium	3.05	1.37	3.05	1.37	3.00	1.41	3.28	1.41
carbohydrate	3.00	1.37	3.00	1.37	3.08	1.44	2.78	1.48
fiber	2.98	1.38	2.98	1.37	2.92	1.52	3.00	1.53
caffeine	2.90	1.44	2.93	1.44	2.85	1.54	2.17	1.25
Iron	2.82	1.36	2.83	1.36	2.69	1.32	2.89	1.45

[a]Scale = 1, not interested; 2, somewhat interested; 3, in between; 4, fairly interested; 5, very interested

[b]No significant differences among means

[c]N varies as follows: Hall residents N = 531-533
Hall staff N = 26
Food committee N = 18

[d]Nutrient components presented in order of descending rating based on mean of total KSU students

student interest ratings on nutrients for any of the variables except gender.

A comparison between male and female students' interest ratings indicated that female students showed a greater degree of interest in knowing nutrient content of a meal than did male students (Table 7). Females were most interested in calories; males were most interested in protein. Both groups also indicated interest in cholesterol and fat.

Aboul-ela's (2) study concerning university women food attitude, reported that female respondents desired desserts items on the menu once a week or less although most of the desserts listed were checked as "like" by a high proportion of students. The author explained that limiting caloric intake was a concern among women students, and she believed a study of men students would be expected to show some different attitudes.

Correlation

Nutrients. Results of correlation analysis for student interest ratings for nutrient components are shown in Table 8. According to Backstrom and Hursch-Cesar (49), a correlation coefficient of 0.9 or above is considered very high; 0.7 to 0.9 high; 0.4 to 0.7 moderate-to-substantial; 0.2 to 0.4 low-to-definite; and less than 0.2 negligible. These subjective categories were used to discuss correlation results of this study.

Table 7. Mean ratings[a] for importance of nutrient components for each menu item by gender

nutrient components	total KSU students[b] mean	s.d	gender[c] male mean and std error	female mean and std error
protein	3.16	1.36	3.11 ± 0.17	3.55 ± 0.15
cholesterol	3.44	1.42	2.97 ± 0.22	3.51 ± 0.19
fat	3.28	1.43	2.94 ± 0.17	3.72 ± 0.15
calories	3.60	1.49	2.94 ± 0.17	4.11 ± 0.15
carbohydrate	3.00	1.37	2.86 ± 0.21	3.26 ± 0.19
calcium	3.05	1.37	2.86 ± 0.21	3.58 ± 0.18
sodium/salt	3.17	1.39	2.81 ± 0.21	3.36 ± 0.19
vitamin	3.11	1.38	2.76 ± 0.16	3.25 ± 0.15
fiber	2.98	1.38	2.63 ± 0.16	3.18 ± 4.00
caffeine	2.90	1.44	2.40 ± 0.22	2.89 ± 0.20
iron	2.82	1.36	2.25 ± 0.20	3.06 ± 0.18

[a]Scale = 1, not interested; 2, somewhat interested; 3, in between; 4, fairly interested; 5, very interested

[b]N for male and female vary: 532-533

[c]ratings significantly different by gender $P \leq .001$

Teble 8. Correlations of student ratinge for interest in nutrient componente[a]

	nutrient components									
nutrient components	celories	fet	protein	fiber	vitemin	sodium/ selt	calcium	cholesterol	iron	carbohydrate
celories										
fet	0.68									
protein	0.47	0.67								
fiber	0.50	0.68	0.78							
vitemin	0.42	0.61	0.74	0.77						
eodium/selt	0.52	0.67	0.63	0.65	0.63					
celcium	0.42	0.61	0.72	0.70	0.69	0.66				
cholesterol	0.53	0.71	0.66	0.69	0.64	0.76	0.66			
iron	0.43	0.58	0.69	0.68	0.71	0.64	0.73	0.62		
cerbohydrete	0.51	0.61	0.71	0.70	0.66	0.63	0.65	0.65	0.70	
ceffeine	0.44	0.46	0.47	0.69	0.52	0.53	0.47	0.46	0.55	0.70

[a] N=531-533

all correlatione significant et $p \leq .001$

Moderate-to-substantial and high correlations existed between many of the nutrient interest ratings. Interest ratings for protein were highly correlated with interest ratings for vitamin (r=0.74); calcium (r=0.72); and fiber (r=0.78). Interest ratings for cholesterol were also found to be highly correlated with sodium/salt (r=0.76); and fat (r=0.71). Correlations of cholesterol with sodium and fat might be expected because these three components have been identified jointly as risk factors for coronary heart disease (50).

Nutrition Topics

Means

Table 9 reports the mean results of interest ratings on nutrition topics for each of the sample groups. The total group (TKSU) was used for further data analysis. Results indicated that students were somewhat interested in all nutrition topics. Mean interest ratings appeared to be the greatest for sports/exercise and nutrition and weight control; interest ratings for diabetic diet was the least. Nutrition education programs could be designed to provide information on these topics. Food committee members indicated a greater interest in fiber and vegetarian diet than did the other two sample groups. Handley and Sedlacedk (3) reported students' suggestions on improving their foodservice. While only one percent of comments addressed dieters and vegetarians as a special needs group, this

Table 9. Mean ratings[a] for interest in having additional information on nutrition topics by sample group[b]

nutrient topics[d]	sample group[c]							
	total KSU students		hall residents		hall staff		food committee	
	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.
sports/exercise	3.69	1.33	3.69	1.34	3.65	1.35	3.94	1.11
weight control	3.43	1.52	3.41	1.53	3.69	1.44	3.61	1.54
basic nutrition and Recommended Dietary Allowances (RDAs)	3.23	1.39	3.24	1.40	3.12	1.14	3.28	1.32
cholesterol modification	3.17	1.37	3.18	1.37	3.12	1.24	3.17	1.38
fat modification	3.15	1.42	3.16	1.43	2.96	1.22	3.28	1.36
sodium/salt restriction	2.90	1.36	2.92	1.37	2.69	1.23	2.89	1.23
calcium and osteoporosis	2.87	1.42	2.87	1.42	2.92	1.41	3.00	1.53
fiber	2.80	1.35	2.78	1.36	2.58	1.24	3.67	0.97
vegetarian diet	2.35	1.43	2.31	1.42	2.62	1.53	2.83	1.58
diabetic diet	2.16	1.26	2.18	1.27	2.08	1.09	1.89	1.18

[a]Scale = 1, not interested; 2, somewhat interested; 3, in between; 4, fairly interested; 5, very interested

[b]No significant differences among means

[c]N varies as follows: Hall residents N = 531-533
Hall staff N = 26
Food committee N = 18

[d]Nutrient components presented in order of descending rating based on mean of total KSU students

figure represents approximately 65 diners in the board population. The authors concluded special attention to this group should be considered.

Analysis of Variance

The analysis of variance was used to examine whether differences existed in students' interest ratings for the 10 nutrition topics based on gender, age, semester in hall, nutrition course taken, and experience with physician-ordered diet. Results from the analysis of variance indicated that no significant differneces existed except for gender.

A comparison of male and female students' interest ratings on nutrition topics are listed in Table 10. Topics of most interest to both males and females were sport/exercise and nutrition, weight control, and basic nutrition and RDAs; however, females showed a greater degree of interest in these topics than did male students. One nutrition topic rated especially of more interest to females than males was calcium and osteoporosis. Although interest ratings for vegetarian diet and diabetic diet were lower than other nutrition topics, foodservice managers may want to consider providing nutrition information in these area to satisfy minority group of students.

Bancroft (6) commented that weight control had become as much a part of our conversation as politics and religion not to mention its prominent role in the nation's health

Table 10. Mean ratings[a] for interest in having additional information on nutrition topics by gender

nutrient topics	total KSU students[b]		gender[c]	
			male	female
	mean	s.d	mean and std error	mean and std error
sports/exercise	3.69	1.33	3.38 ± 0.15	4.00 ± 0.14
weight control	3.43	1.52	2.96 ± 0.18	4.00 ± 0.16
basic nutrition and Recommended Dietary Allowances (RDAs)	3.23	1.39	2.87 ± 0.21	3.56 ± 0.19
cholesterol modification	3.17	1.37	2.78 ± 0.16	3.40 ± 0.15
fat modification	3.15	1.42	2.71 ± 0.17	3.59 ± 0.15
fiber	2.80	1.35	2.60 ± 0.16	3.23 ± 0.15
sodium/salt restriction	2.90	1.36	2.56 ± 0.21	3.04 ± 0.19
calcium and osteoporosis	2.87	1.42	2.42 ± 0.20	3.54 ± 0.18
vegetarian diet	2.35	1.43	2.14 ± 0.16	2.99 ± 0.15
diabetic diet	2.16	1.26	1.96 ± 0.19	2.20 ± 0.17

[a]Scale = 1, not interested; 2, somewhat interested; 3, in between; 4, fairly interested; 5, very interested

[b]N for male and female vary: 532-533

[c]ratings significantly different by gender $P \leq .001$

problems. It is not surprising that weight control is a high priority for college students, because of the emphasis placed upon body image and the fear of obesity during adolescence (51). Hovell et al. (52) indicated that women were far more likely to gain weight during their freshman year of college if they ate in university cafeterias under a mandatory broad plan. Arrington et al. (53) studied weight reduction methods of college women. They reported that of the 400 subjects, 191 or 48 percent of their sample indicated following a weight reduction program since their enrollment at the university. The weight reduction program most often selected included hypocaloric diets and exercise (47 and 19 percent). The subjects reported that figure improvement was the main incentive for following a weight reduction. Evers (54) also reported that college women were under pressure of social pressure to lose weight. Kubena and Carson (24) indicated that female students were more like to be aware of and to use the Calorie Aware Program than were males. The authors reported more than half of the women who reported weights in the desirable range wanted to lose weight, while only about one-quarter of the men in that weight category wanted to reduce their weight. This indicated a difference of perception of body image between males and females. Data from the present study support this conclusion. Parraga (5) reported that in a college student health clinic, the most frequently made referrals by physicians to the dietitian was weight reduction diet (61%).

The results agree with Carlson and Tabacck's study (23) which commented that nutrition-conscious among the general public was not a fad, but was part of a life style changes occurring in the United States. The authors described that this change in attitude exhibited in behavior that showed increasing consumer awareness of health and physical fitness.

Correlation

Nutrition Topics. Correlation coefficients for nutrition topics were computed and are shown in Table 11. High correlations were found between fat modification and cholesterol modification (r=0.75); cholesterol and sodium/salt restriction (r=0.66). Such a relation is not surprising since these topics are usually mentioned and discussed together. The National Cholesterol Education Program of the National Heart, Lung, and Blood Institute (55) discussed the primary treatment for high blood cholesterol as a diet low in saturated fat and low in cholesterol. Dietary guidelines for preventing heart disease suggested by the American Heart Association (50) include reducing cholesterol and avoid excess sodium.

Nutrients and Nutrition Topics. Correlations between students' interest ratings for nutrient components and nutrition topics suggests a possible relationship between these factors (Table 12). Results indicate that if students were interested in knowing about a specific nutrient

Table 11. Correletione of student ratings for interest in nutrient topics[a]

nutrient topice	nutrition topics								
	weight control	sodium/ selt restrition	sporte/ exercise nutrition	fet modifi- cation	cholesterol modifi- cation	diebetic diet	fiber	vegeterien diet	calcium & osteo- porosis
weight control									
sodium/ealt reetrition	0.51								
sporte/exercise	0.58	0.52							
fet modificetion	0.55	0.63	0.61						
cholesterol modificetion	0.51	0.66	0.55	0.76					
diabetic diet	0.30	0.45	0.24	0.36	0.41				
fiber	0.43	0.48	0.49	0.55	0.59	0.44			
vegeterien diet	0.35	0.38	0.35	0.42	0.37	0.47	0.51		
celcium end oeteoporosie	0.50	0.53	0.48	0.57	0.56	0.40	0.61	0.52	
basic nutrition end Recommended Oietery Allowencee (ROAs)	0.51	0.52	0.54	0.56	0.60	0.35	0.60	0.39	0.66

[a]N= 532-533

ell correlations eignificent at $p \leq 0.001$

Table 12. Correlations of student ratings for interest in nutrient components and nutrition topics[a]

nutrient components	nutrition topics									
	weight control	sodium/ salt restrition	aporta/ exercise nutrition	fat modifi- cation	cholesterol modifi- cation	diabetic diet	fiber	vegetarian diet	calcium & osteo- porosis	basic nutrition and RDAs
calories	0.62	0.47	0.53	0.52	0.50	0.28	0.41	0.37	0.42	0.48
fat	0.47	0.54	0.48	0.65	0.57	0.30	0.47	0.35	0.45	0.49
protein	0.36	0.44	0.42	0.50	0.49	0.36	0.51	0.38	0.48	0.50
fiber	0.35	0.48	0.42	0.55	0.54	0.36	0.69	0.44	0.52	0.52
vitamin	0.31	0.54	0.37	0.44	0.48	0.30	0.48	0.35	0.46	0.50
sodium/salt	0.35	0.63	0.40	0.50	0.55	0.34	0.44	0.34	0.46	0.47
calcium	0.35	0.49	0.44	0.49	0.48	0.32	0.51	0.40	0.62	0.50
cholesterol	0.36	0.53	0.42	0.57	0.69	0.29	0.49	0.28	0.45	0.52
iron	0.31	0.47	0.30	0.45	0.46	0.38	0.51	0.43	0.52	0.49
carbohydrate	0.40	0.50	0.45	0.53	0.52	0.35	0.51	0.37	0.50	0.51
caffeine	0.33	0.43	0.32	0.36	0.40	0.33	0.37	0.27	0.36	0.39

[a]N= 531-533

all correlations significant at $p \leq 0.001$

component on the menu, they were also interested in receiving additional information on nutrition topics related to those nutrients. For example, a moderate correlation was noted between students' interest in knowing cholesterol content for each menu item and their interest in receiving additional information on cholesterol modification (r=0.69). Similar patterns were observed between interest ratings for fiber, fat and sodium.

Nutrition Computer Software Features

Means

Mean student interest ratings in obtaining nutrition information are compiled in Table 13. Results from all sample groups indicated that students were at least somewhat interested in all nutrition computer program features. The strongest interest for nutrition computer program features was for recommendations to correct diet for nutrient deficiencies and individualized analysis for a meal and/or a day; the least interest was in diabetic exchange list information. Computer generated nutrition information might be used as nutrition education marketing tools for residence hall foodservice.

Analysis of Variance

The analysis of variance was used to determine whether differences existed in students' interest ratings for seven nutrition computer program features based on gender, age,

Table 13. Mean ratings[a] for interest in obtaining nutrition information from a computer software program by sample group[b]

computer program features[d]	sample group[c]							
	total KSU students		hall residents		hall staff		food committee	
	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.
recommendation to correct diet for nutrient deficiencies	3.41	1.46	3.41	1.47	3.31	1.52	3.44	1.25
individual analysis for a meal and/or day	3.35	1.47	3.36	1.48	2.96	1.54	3.56	1.15
actual food intake compared to RDAs	3.27	1.43	3.28	1.45	3.08	1.35	3.33	1.14
recommendations to correct diet for nutrient excess	3.27	1.46	3.27	1.47	3.08	1.44	3.39	1.14
percent of carbohydrate, fat and protein in what you eat	3.27	1.44	3.28	1.45	2.96	1.48	3.44	1.20
saturated/polyunsaturated fat ratio	2.91	1.41	2.91	1.42	2.62	1.42	3.28	1.13
diabetic exchange list	2.13	1.27	2.13	1.28	2.31	1.35	1.94	0.94

[a]Scale = 1, not interested; 2, somewhat interested; 3, in between; 4, fairly interested; 5, very interested

[b]No significant differences among means

[c]N varies as follows: Hall residents N = 531-533
Hall staff N = 26
Food committee N = 18

[d]Nutrient components presented in order of descending rating based on mean of total KSU students

semester in hall, nutrition course taken, and experience with physician-ordered diet. Results from the analysis of variance indicated that no significant differences except for gender.

Mean student interest ratings for obtaining nutrition information from a computer software program are listed in by gender in Table 14. Female students tended to indicate greater interest in all computer program features than did male students. Items of most interest to both groups were recommendations to correct diet for nutrient deficiencies and individualized analysis from a meal and/or day.

Correlation

Computer Program Features. Results of the correlation analysis for students' interest ratings for computer program features are shown in Table 15. Student interest in obtaining computer information on the diabetic exchange list was not strongly correlated with any other feature which may be related to the fact that few students were on a diabetic diet. The two computer program features which contained recommendations for correcting the diet were strongly correlated with each other (r=0.88). Similarly, the two program features which provided information related to the fat content in the diet for deficiencies or excesses either as a percent or a ratio were strongly correlated (r=0.77).

Nutrients and Computer Program Features. The correlation analysis for students' interest ratings in knowing content

Table 14. Mean ratings[a] for interest in obtaining nutrition information from a computer software program by gender

Computer program features	total KSU students[b] mean	s.d	gender[c] male mean and std error	female mean and std error
recommendations to correct diet for nutrient deficiencies	3.41	1.46	3.09 ± 0.17	3.96 ± 0.16
individualized analysis for a meal and/or day	3.35	1.47	3.07 ± 0.17	3.93 ± 0.15
actual food intake compared to RDAs	3.27	1.43	2.95 ± 0.17	3.77 ± 0.15
recommendations to correct diet for nutrient excess	3.27	1.46	2.92 ± 0.17	3.53 ± 0.16
percent of carbohydrate, fat and protein in what you eat	3.27	1.44	2.80 ± 0.17	3.59 ± 0.16
saturated/polyunsaturated fat ratio	2.91	1.41	2.70 ± 0.17	3.45 ± 0.15
diabetic exchange list	2.13	1.27	2.08 ± 0.15	2.44 ± 0.14

[a]Scale = 1, not interested; 2, somewhat interested; 3, in between; 4, fairly interested; 5, very interested

[b]N for male and female vary: 532-533

[c]ratings significantly different by gender $P \leq .001$

Table 15. Correlations of student ratings for interest in computer program features[a]

No.	computer program features	No. 1	2	3	4	5	6
1	percent of carbhoydrate, protein and fat in what you eat						
2	individualized analysis for a meal and/or day	0.75					
3	saturated/polyunsaturated fat ratio	0.77	0.72				
4	diabetic exhchange list	0.44	0.45	0.51			
5	actual food intake compared to Recommended Dietary Allowances (RDAs)	0.65	0.72	0.58	0.41		
6	recommendations to correct diet for nutrient excess	0.69	0.73	0.61	0.43	0.74	
7	recommendations to correct diet for nutrient deficiencies	0.69	0.75	0.65	0.39	0.75	0.88

[a]N = 531-533

all correlations significant at $p \leq .001$

of specific nutrients in a meal and their interest in obtaining information for various computer program features are shown in Table 16. Interest in obtaining carbohydrate, protein and fat for each menu item were moderately correlated with computer features which indicated percent of carbohydrate, protein and fat for a meal/diet (r=0.61, 0.59, 0.61 respectively). Similarly, moderate correlations were found between interest in knowing fat and cholesterol content and interest in obtaining computer information in the analysis of saturated fat/polyunsaturated fat ratio (r=0.64 and r=0.59).

Nutrition Topics and Computer Program Features. Results of correlation analysis for students' interest ratings on various nutrition topics and computer program features are shown in Table 17. Results indicate students' interest ratings of certain nutrition topics were moderately correlated with their interest in obtaining those nutrition information through a computer software program. For example, interest ratings for fat modification and cholesterol modification were moderately correlated with saturated fat/polyunsaturated fat ratio information from the computer program (r=0.65 and r=0.61). A moderate correlation also was found between students' interest rating for diabetic diet and students' interest rating for computer-generated diabetic exchange list (r=0.69).

Table 16. Correlations of student ratings for interest in nutrient components and computer program features[a]

nutrient components	computer program features[b] No. 1	2	3	4	5	6	7
calories	0.51	0.48	0.44	0.30	0.44	0.52	0.51
fat	0.61	0.57	0.64	0.36	0.46	0.55	0.56
protein	0.59	0.51	0.54	0.40	0.42	0.45	0.46
fiber	0.55	0.50	0.57	0.40	0.43	0.45	0.48
vitamin	0.51	0.50	0.48	0.38	0.42	0.44	0.47
sodium/salt	0.52	0.50	0.54	0.38	0.45	0.46	0.48
calcium	0.52	0.49	0.56	0.39	0.42	0.45	0.50
cholesterol	0.56	0.52	0.59	0.32	0.44	0.47	0.50
iron	0.51	0.52	0.54	0.42	0.46	0.48	0.49
carbohydrate	0.61	0.53	0.56	0.41	0.47	0.54	0.54
caffeine	0.40	0.40	0.40	0.35	0.39	0.40	0.39

[a] $N = 531-533$

[b] 1 percent of carbohydrate, protein and fat in what you eat
2 individualized analysis for a mean and/or day
3 saturated/polyunsaturated fat ratio
4 diabetic exchange list
5 actual food intake compared to Recommended Dietary Allowances (RDAs)
6 recommendations to correct diet for nutrient excess
7 recommendations to correct diet for nutrient deficiencies

all correlations significant at $p \leq .001$

Table 17. Correlations of student ratings for interest in nutrient topics and computer program features[a]

nutrient topics	computer program features[b] No. 1	2	3	4	5	6	7
weight control	0.45	0.45	0.40	0.33	0.44	0.53	0.49
sodium/salt restrition	0.61	0.57	0.64	0.36	0.46	0.55	0.56
sports/exercise	0.50	0.43	0.44	0.25	0.47	0.50	0.51
fat modification	0.59	0.54	0.65	0.38	0.48	0.55	0.54
cholesterol modification	0.54	0.50	0.61	0.37	0.48	0.52	0.53
diabetic diet	0.28	0.28	0.33	0.69	0.28	0.30	0.28
fiber	0.49	0.45	0.54	0.41	0.45	0.46	0.49
vegetarian diet	0.42	0.39	0.41	0.48	0.34	0.38	0.37
calcium and osteoporosis	0.50	0.47	0.51	0.43	0.48	0.52	0.53
basic nutrition and Recommended Dietary Allowances (RDAs)	0.53	0.54	0.50	0.35	0.64	0.57	0.60

[a] N = 532-533

[b] 1 percent of carbohydrate, protein and fat in what you eat
2 individualized analysis for a mean and/or day
3 saturated/polyunsaturated fat ratio
4 diabetic exchange list
5 actual food intake compared to Recommended Dietary Allowances (RDAs)
6 recommendations to correct diet for nutrient excess
7 recommendations to correct diet for nutrient deficiencies

all correlations significant at $p \leq .001$

Comments

Students were given the opportunity to make specific comments about other areas of interest or concern related to nutrition information provided by the university residence hall foodservice in a open-ended question. Comments were compiled and a complete list given to the Head of Residence Hall Foodservice.

In general, students comments tended to focus on four major areas: fat/cholesterol, calories, weight control and vegetarian diet. Students comments supported their high interest ratings (Table 6, 9) on these key nutrition topics areas. Students commented that they would like more food choices which were low in fat and cholesterol. They preferred less fried food and wanted more fresh fruits, salads and vegetables.

Calories was another topic which received several student comments. Comments in this areas indicated that weight control is one of the key areas of student interest. which was reflected in the high student interest ratings on calories, weight control, and sports and exercise nutrition (Tables 6, 9). Students commented that they would like to have information on calories per serving for each menu item posted on the cafeteria lines. They also requested the calorie content for foods served on the taco, hamburger, and soup and salad line service areas. Several students

responded that one of the meal choices served at each meal should be low in calories, fat, and cholesterol.

Students were interested in knowing sugar content of food served. Several students commented that they would like to know how to adjust their food consumption to control their weight. They requested more information on energy expenditure in various physical activities as well as behavior modification techniques for weight control.

More than ten female students commented regarding vegetarian diet. Several of them commented that they were ovo-lacto vegetarian and asked for more vegetarian meal options. Richie (4) commented that vegetarianism was gaining its popularity with a vocal minority among college students. This trend appeared in this study as well.

Many students commented that they enjoyed getting nutrition information from table-tents in the dining room. These result was similar to Milano's (9) and Anderson and Terry's studies (10) both indicating table tents were frequently read and perceived as helpful tools in delivering nutrition information. Some students commented. however, that a conflict existed between the material discussed on the table-tents and foods items actually served. These comments were particularly related to the fat and sodium content of food. Several students indicated that table-tents should coordinate with the weekly menu. More than ten students commented that they were interested in having an individualized diet nutrient analysis if it were available.

SUMMARY AND CONCLUSIONS

College and university students have become more fitness-oriented and health-conscious, and they request healthful food choices from university residence hall foodservice. The objectives of this research were to identify nutrients and nutrition topics in which university students were interested; determine the degree of interest by university students for computerized nutrition information; and compare the degree of interest in nutrition information by gender, age, and length of time living in a residence hall.

The study was conducted at a large land-grant midwestern university. There are nine residence halls on the campus housing approximately 4,000 students; three central food centers serve students living in the residence halls.

Data were collected to determine students' interest in obtaining information on various nutrients, nutritional topics, and students' interest in utilizing computer generated nutrition information. A questionnaire was developed and used to collect these data.

A stratified random sample of 20 per cent of students living in the residence halls serviced by the three food centers was selected to complete the questionnaire. A group of 26 newly appointed hall staff, employed by the Department of Housing; and 18 food committee members who were elected by their floor to gather food concerns also participated in the study.

The questionnaire consisted of 13 questions and was divided into four major sections: biographic/demographic, nutrient components, nutritional topics, and desired nutrition information from computer. The front page contained the biographic/demographic section which included questions on gender, age, student classification, major, number of semesters in residence hall, food center and line for noon and evening meals, nutrition related courses taken in high school or college, and experience with a physician-ordered diet.

Questions on nutrient components, nutritional topics, and desired nutritional information from computer sections on the back page of the questionnaire were rated using the same five-point scale to indicate the degree of interest in each question. The scale ranged from 1 not interested to 5 very interested.

Frequencies, means, Pearson Products Moment Correlation Coefficient, Chi square, and the general linear model analysis of variance procedure in the Statistical Analysis System (SAS) were used to analyze for the study. A total of 829 questionnaire were distributed to study participants; 534 questionnaires were completed and returned for a response rate of 62.4 percent. The majority of students were in the age range 18-22 years old and were classified as freshmen. The greatest percent of students had lived in the residence halls only one semester prior to the study.

Results suggest that students are now more interested in alternative food choices, such as hamburgers and tacos, than they were previously. Less than half of the students had taken a nutrition related course in high school and/or college. Very few students were on a physician-ordered diet.

Analysis of variance indicated no significant differences existed in the three sample groups; therefore, they were combined prior to further data analysis. Results indicated that students did not have a strong interest or disinterest for any of the 11 nutrients. The nutrient of most interest were calories, cholesterol, and fat. Results from the analysis of variance indicated that no significant differences were found on students' interest ratings on nutrients except for gender. Female students showed a greater degree of interest than male students in all nutrients. Female students indicated the greatest interest for calories; male students were most interested in protein.

Students interest ratings for nutrition topics indicated that they were somewhat interested in all nutrition topics. The greatest interest was in the topics sports/exercise and nutrition and weight control; the least interest was for diabetic diet. Analysis of variances indicated no significant differences for nutrition topics except for gender. Females indicated a greater interest than males for all topics.

The greatest interest for nutrition computer program features were for recommendations to correct diet for nutrient deficiencies and individualized analysis for a meal and/or a day; the least interest was in diabetic exchange list information. Results from the analysis of variance indicated no significant differences for students' interest ratings on any nutrition program features except for gender. Student interest in knowing certain nutrient component for each menu item and their interest in obtaining that information from a computer printout were correlated.

Student comments focused on four major areas: fat/cholesterol, calories, weight control and vegetarian diet. Students stated they would like more food choices which were low in fat and cholesterol, less fried food, and more fresh fruits, salads and vegetables. Although student interest ratings for information on vegetarian diet was limited, student comments suggest that this vegetarian group is growing in numbers and requests for more vegetarian food options were made. Students also commented that they enjoyed getting nutrition information from table-tents in the dining room.

Results of this study suggest foodservice managers may want to consider providing information on the calorie, cholesterol, and fat content for each menu item. Because students indicated interest in sports/exercise and nutrition, weight control, and basic nutrition and RDAs,

these topics should be included in the residence hall nutrition education program. Foodservice managers also may want to consider using computers as nutrition education marketing tools. Program features such as recommendations to correct diet for nutrient deficiencies and excesses, and individualized diet analysis are ones which students expressed strongest interest in.

Further study should be conducted with all food committee members to determine if food committee members have different nutrition concerns than the general student group. Additional research with students from other universities is needed to assess whether interest in nutrition information differs based on geographical location.

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APPENDIX A

Questionnaire

Nutritional Analysis Survey --- Spring 1989

Department of Housing
Pittman Building
Manhattan, Kansas 66506

Nutritional Analysis Survey – Spring 1989

Please complete this questionnaire and return it to your hall staff or to the foodservice office Results will be compiled and posted in each food center

PLEASE CHECK

1 Gender

___ (1) Male
___ (2) Female

2 Present age in years

___ (1) 18 or under
___ (2) 19 - 22
___ (3) 23 or over

3 Classification

___ (1) Freshman
___ (2) Sophomore
___ (3) Junior
___ (4) Senior
___ (5) Graduate

4 Major

___ (1) Agriculture
___ (2) Architecture
___ (3) Arts & Sciences
___ (4) Business Administration
___ (5) Education
___ (6) Engineering
___ (7) Human Ecology
___ (8) Veterinary Medicine
___ (9) Undecided

5 Number of semesters in KSU Residence Hall (omit current semester)_____
(please fill in blank)

6 In which Residence Hall do you live? _____(fill in blank)

7 In which Food Center do you typically eat your noon meal?

___ (1) Kramer (please specify line) _____
___ (2) Derby (please specify line) _____
___ (3) Boyd

8 In which Food Center do you typically eat your evening meal?

___ (1) Kramer (please specify line) _____
___ (2) Derby (please specify line) _____
___ (3) Boyd

9 Have you taken any nutrition related course(s) in high school or college?

___ (1) No
___ (2) Yes _____ (please indicate course name(s))

10. Are you now or have you been on a physician-ordered diet?

___ (1) No
___ (2) Yes (please specify) _____

- - - PLEASE TURN OVER TO COMPLETE QUESTIONNAIRE - - -

Please answer all the following statements using this code.

1 = not interested
2 = somewhat interested
3 = in between
4 = fairly interested
5 = very interested

11. How interested are you in knowing the following components for each menu item?

1	Calories	1	2	3	4	5
2	Fat	1	2	3	4	5
3	Protein	1	2	3	4	5
4.	Fiber	1	2	3	4	5
5	Vitamins	1	2	3	4	5
6	Sodium/salt	1	2	3	4	5
7	Calcium	1	2	3	4	5
8.	Cholesterol	1	2	3	4	5
9	Iron	1	2	3	4	5
10.	Carbohydrate	1	2	3	4	5
11.	Caffeine	1	2	3	4	5
12	Others (please specify) _____	1	2	3	4	5
13	(please specify) _____	1	2	3	4	5
14	(please specify) _____	1	2	3	4	5

12 How interested are you in having additional information on the following nutrition topics?

1.	Weight control	1	2	3	4	5
2	Sodium/salt restriction	1	2	3	4	5
3.	Sports/exercise and nutrition	1	2	3	4	5
4.	Fat modification (saturated fat)	1	2	3	4	5
5	Cholesterol modification	1	2	3	4	5
6	Diabetic diet	1	2	3	4	5
7.	Fiber	1	2	3	4	5
8.	Vegetarian diet	1	2	3	4	5
9.	Calcium and osteoporosis	1	2	3	4	5
10.	Basic nutrition and Recommended Dietary Allowances (RDA)	1	2	3	4	5

13 If the following information was available through a computer software program, please indicate your interest in knowing:

1.	Percent of carbohydrate, protein and fat in what you eat	1	2	3	4	5
2	Individualized nutrient analysis for a meal and/or day	1	2	3	4	5
3.	Saturated fat/Polyunsaturated fat ratio	1	2	3	4	5
4	Diabetic exchange list	1	2	3	4	5
5.	Actual food intake compared to the Recommended Dietary Allowances (RDA)	1	2	3	4	5
6	Recommendations to correct diet for nutrient excesses	1	2	3	4	5
7.	Recommendations to correct diet for nutrient deficiencies	1	2	3	4	5

Please indicate any other areas of interest or concern related to nutritional information:

APPENDIX B

Memo to Hall Director

KSU
KANSAS STATE UNIVERSITY

Department of Housing

Putman Building
Manhattan, Kansas 66506
913-532-6453

Date March 3, 1989

From Mei-po Cheung
Dietitian

John Pence
Head, Residence Hall Foodservice

Dear Hall Director/Assistant Hall Director:

At Kansas State University we are currently engaged in a project to evaluate the residents' desire for and use of nutrition information in our Residence Hall Foodservice. This survey has been approved by the KSU Department of Housing and is being coordinated by Mei po Cheung, dietitian at Kramer Food Center. We believe that the survey will provide us with valuable information to better meet the students' needs.

Attached are copies of the letter sent to the hall staff and the actual survey for your reference. We hope to complete the survey next week before Spring break. For this project to be successful, we need your support.

If you have questions about this survey, please call or leave a message for Mei-po Cheung at 532-7836. Results of this study will be compiled and posted in each food center.

Thank you for your attention.

APPENDIX C

Memo to Hall Staff

KANSAS STATE UNIVERSITY

Department of Housing

Pittman Building
Manhattan, Kansas 66506
913 532 6453

Date: March 3, 1989

To: Hall Staff

From: Mei-po Cheung
Dietitian

John Pence
Head of Residence Hall Foodservice

We need your assistance with research being conducted by Residence Hall Foodservice to evaluate residents' desire for and use of nutrition information. This survey has been approved by the KSU Department of Housing and is being coordinated by Mei-po Cheung, dietitian at Kramer Food Center. Results of this survey will provide us with valuable information for developing goals for our nutrition education programs. Your help with this project will ensure its success.

A package of questionnaires and accompanying materials will be sent to you through campus mail for distribution to randomly selected residents on your floor.

Would you please assist us with the following steps?

STEP 1 Distribute the questionnaires to the selected floor residents and encourage them to participate in this survey.

STEP 2 Post the envelope labeled "Nutrition Survey" in a convenient location for residents to return the completed surveys.

STEP 3 Return all the collected questionnaires in the self-addressed envelope provided and send it through campus mail BEFORE Spring break (Friday, March 10, 1989).

If you have questions about this survey, please call or leave a message for Mei-po Cheung at 532-7836.

We appreciate your time and effort in helping with this research.

APPENDIX D

Cover Letter Hall Staff
Cover Letter to Hall Residents

KSU
KANSAS STATE UNIVERSITY

Department of Housing

Pittman Building
Manhattan, Kansas 66506
913-532-6453

March 20, 1989

Dear Hall Resident:

At Kansas State University we are currently engaged in a project to evaluate your desire for and use of nutrition information in our Residence Hall Foodservice. This survey has been approved by the KSU Department of Housing and is being coordinated by Mei-po Cheung, dietitian at Kramer Food Center. We believe that the survey will provide us with valuable information to better meet your needs.

You have been randomly selected to participate in this study. It will take approximately 5 to 10 minutes for you to complete this questionnaire. We encourage you to respond to all questions. A large envelope will be posted at a convenient location on your floor. Please place the completed questionnaire in the envelope BY Friday, March 24, 1989

For this project to be successful, we need your involvement. The data will be kept completely confidential and used only for the purpose of this study. Your name will not be linked to your individual responses in any way.

If you have questions about this survey, please call or leave a message for Mei-po Cheung at 532-7836. Results of this study will be compiled and posted in each food center.

Your cooperation is greatly appreciated.

Sincerely,

Cheung Mei Po

Mei-po Cheung
Dietitian

John Pence
Head, Residence Hall Foodservice

APPENDIX E

Classroom Nutrition Knowledge of University Students

Classroom nutrition knowledge of university students

question	gender				total	
	male		female			
	N	%	N	%	N	%
Have you taken a nutrition related class in high school/or college?						
no	153	63.0	173	59.5	326	61.0
yes	90	37.0	118	40.5	208	39.0
total	243	100.0	291	100.0	534	100.0

APPENDIX F

Experience of a Physician-ordered Diet of University Students

Experience of a physician-ordered diet of university students

question	gender				total	
	male		female			
	N	%	N	%	N	%
Are you now or have you been on a physician-ordered diet?						
no	235	96.7	255	87.6	490	91.8
yes	8	3.3	36	12.4	44	8.2
total	243	100.0	291	100.0	534	100.0

INTEREST IN NUTRIENT INFORMATION, NUTRITION TOPICS AND COMPUTER-GENERATED NUTRITION INFORMATION BY COLLEGE STUDENT

by

Mei-po Cheung

B.A., The University of Iowa, 1987

AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Hotel, Restaurant, Institution Management, and Dietetics

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1989

ABSTRACT

The purpose of this study was to study university residence hall students' interest in nutrition information. A questionnaire was developed and used to collect students' demographic data, interest in obtaining information on various nutrient and nutrition topics, and interest in utilizing computer-generated nutritional information.

The sample group included a stratified random sample of 20 per cent of hall residents, 26 newly appointed hall staff and 18 food committee members. A total of 829 questionnaires were distributed; 534 were returned (62.4%).

The majority of respondents were freshmen, 18-22 years old. Less than half (39%) of the students had taken a nutrition related course in high school and/or college. Very few students were on a physician-ordered diet.

The nutrients of most interest were calories, cholesterol, and fat. Female students showed significantly greater interest than male student in all nutrients. Females indicated greatest interest in calories; males in protein. Nutrition topics of most interest were sports/exercise and nutrition and weight control; the least interest was in diabetic diets. Nutrition computer program features of greatest interest were recommendations to correct the student's diet for nutrient deficiencies and individualized analysis for a meal and/or a day; the least interest was in diabetic exchange list information.

Results of this study suggest university foodservice managers may want to consider providing information regarding calories, fat, cholesterol and sodium content for each menu item. More food choices low in fat and cholesterol, less fried food, and more fresh fruits, salads and vegetables were requested. Because students indicated interest in sports/exercise and nutrition, weight control, and basic nutrition, these topics should be included in the residence hall nutrition education program. Foodservice managers also may want to consider using computers as nutrition education marketing tools. Program features such as recommendations to correct one's diet for nutrient deficiencies and excesses, and individualized diet analysis are areas in which students expressed strongest interest. Student comments suggest vegetarian food options should be expanded. Additional research with students from other universities is needed to assess whether interest in nutrition information differs based on geographical location.